NEW APPROACHES TO ENVIRONMENTAL MANAGEMENT: LESSONS FROM THE CHESAPEAKE BAY

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Ecosystem Management

Coastal management is evolving from a limited, compartmentalized endeavor that seeks to manage land uses and human activities in the narrow coastal zone to an expansive, integrated activity that reaches far inland, addresses water and air quality, incorporates fisheries and other living resource management, and engages society's future life style choices. This requires an ecosystem approach that broadly embraces the physical environment and the biota, including the humans that dominate these ecosystems. Furthermore, an ecosystem approach must be place-based, thus restricting the efficacy of uniformly applied solutions. Everyone seems to embrace this concept, but how do we actually employ ecosystem management, particularly on the large, regional scales necessary for major estuaries and bay.

The Chesapeake Bay Program represents perhaps the most ambitious and costly effort to restore a major coastal ecosystem and manage activities not only in the coastal zone but also in a vast catchment area—64,000 square miles in this case. It has been going on, in one way or another, for about 20 years and is the conceptual parent of the National Estuary Program in which some 28 estuaries are enrolled. What can we learn from this experience? Where does this experiment in ecosystem management need to go in the 21st Century?

Commitments

The Chesapeake Bay Program owes its longevity and successes to the high and sustained level of societal commitment it has enjoyed. It is directed by an Executive Council that includes the Governors of Pennsylvania, Maryland, and Virginia, the Mayor of the District of Columbia, the Administrator of the U.S. Environmental Protection Agency (EPA) and the Chair of the Chesapeake Bay Commission, an organization of the state legislatures of the region. They are actually involved, they show up at the annual meetings, and they know that their constituents support this effort. They bring the weight and force of the agencies in their jurisdictions to participate. Furthermore, the glue which has held this together has been a sustained federal appropriation for administration, assessment, public outreach, and implementation. But this federal investment is multiplied multi-fold by investments of states and local communities. The commitments are high level, sustained, significant, and popularly based.

Goals

The Chesapeake Bay Program has set goals, even when it was not crystal clear what those goals should be. The major focusing goal has been to reduce controllable sources of nutrients by 40% by the year 2000, but there have been other numerical goals as well. These goals serve to focus bureaucratic attention and provide a framework and currency for debates. Goals have a dimension that assists public understanding and stimulates political commitments. For example, the recalcitrant former Governor of Virginia finally surrendered to the pressure of the other members of the Executive Council for a riparian restoration goal of 2000 miles by 2010, but because of his political genius suggested that the goal of 2010 miles by 2010 sounds better!

Science

The Chesapeake Bay Program prides itself in being science-based. The initial directions and goals were established following a 5 year study phase. There is a remarkable level of "science literacy" among the operatives, assisted by the remarkable and widely distributed Bay Journal. There is a heavy reliance on computer modeling and environmental modeling. There is perhaps the largest aggregation of coastal science in the nation in the region. However, as we move past the year 2000 milestone, it is clear that scientific activities need to be more strategic and forward-looking. Furthermore, because so many key uncertainties now reside on the land, in the watershed, there is a need to boost and link the science of landscape changes, hydrological dynamics, and social choices into the Program.

Models

Great emphasis has been placed on the development and application of sophisticated computer models of the Bay and its watershed. These models are linked so that one can examine the effects of changes in future land uses or agricultural practices or even the effects of the Clean Air Act on delivery of nutrients to the Bay and their effects on dissolved oxygen, food chains, and seagrasses. Although these models may sometimes seduce managers in believing that they represent the real world rather than a virtual world, they have tremendous power in tracking progress, identifying more significant problems, and determining the effects of management alternatives.

Monitoring

The Chesapeake Bay Program, in conjunction with the State agencies, operates the largest and most extensive monitoring program of any coastal ecosystem in the world. It has been going on for over 13 years now. The monitoring program is the plowhorse in contrast to the flashy show horse that is the modeling program. To managers, models provide firm results and can make predictions, while monitoring results are subject to natural and stochastic variability and are inherently retrospective. The monitoring program costs lots of money, money that can be spent to implement programs, hire more office staff, or hold meetings. They are hard to sustain. Yet, environmental monitoring is absolutely essential if we are to practice adaptive environmental management, i.e. management that recognizes that it's hard to predict anything about a complex ecosystem, particularly about the future, and approaches its task with humility and an interest in observing and learning.

Sustainable Resource Use

Why are we trying to reduce nutrient inputs and improve water quality if not for the fish, shellfish, and birds we enjoy and use? Furthermore, does it make much sense for us to restore this ecosystem and overfish or otherwise abuse these resources? Moreover, it has become increasingly clear that steps taken to manage one species, striped bass, for example, may have consequences to other resources, menhaden and blue crabs, for example.

The first generation of Chesapeake Restoration goals was based on something we could measure and count—nutrient inputs. The next generation of restoration goals will be living resource-based. But what kind of meaningful goals can we set and measure? And how do we develop strategies for multi-species management in an ecosystem context? This is one of the major challenges for the future of Chesapeake Bay restoration and management.

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Managing Growth

The commitments and goals for Chesapeake Bay restoration include a "cap," by which once the nutrient input goals are met they will not be exceeded in the future. This means that the effects of all future population growth and land development must be offset by gains in efficiency. With conversion of forested and agricultural land taking place at rates three times greater that the rate of population growth in some areas, for example in the greater Washington, D.C. area, this is a daunting proposition. The rates of land development are clearly unsustainable, not only to meet and hold Bay restoration goals but also in terms of infrastructure demands and quality of life considerations. As a result, the Chesapeake Bay watershed, and the Washington-Baltimore region in particular, has become the hotbed of the Smart Growth movement. The recently announced Clinton-Gore initiative in this area provides opportunities for other coastal regions to begin to address the problems of their future landscapes.

Climate Change

We live in a changing world. Not only is the Chesapeake Bay of today not John Smith's Bay of the 17th Century, the Bay of 100 years from now will be different from either of these. Not only will the outcome be related to how well we have met restoration goals and held gains in the face of population growth and social change, but it is becoming increasingly clear that our climate will change in non-trivial ways, both on global and regional scales. The Chesapeake Bay Program needs now to begin to take heed of these possible changes, both in terms of its scientific investigations and management alterna-

tives. Much has been written about accelerated sea level rise in the warmer world we face. This will have consequences for the Chesapeake Bay as well as other coastal areas. An additional, and perhaps more significant, challenge that we face in the Chesapeake is the prospect for increased freshwater runoff that climate models indicate are likely. These would not only affect the salinity distribution in the estuary, but would deliver more nutrients and result in greater density stratification, thus worsening the effects of eutrophication. The hill we are climbing to restore this great ecosystem may become even steeper.